DOCUMENT RESUME

ED 476 707 SE 067 882

AUTHOR	Wang, Tzu-Hua; Wang, Wei-Lung; Wang, Kuo-Hua; Huang, Shih-Chieh
TITLE	Using Hi-FAME (High Feedback-Assessment-Multimedia-Environment) Instructional Model in WBI: A Case Study for Biology Teacher Education.
PUB DATE	2003-04-00
NOTE	7p.
PUB TYPE	Reports - Research (143)
EDRS PRICE	EDRS Price MF01 Plus Postage. PC Not Available from EDRS
DESCRIPTORS	*Biology; Educational Technology; *Evaluation Methods; Higher Education; *Pedagogical Content Knowledge; *Preservice Teacher Education; Science Education; Teaching Methods; *World Wide Web

ABSTRACT

The study attempted to adapt two web tools, FFS system (Frontpage Feedback System) and WATA system (Web-based Assessment and Test Analysis System), to construct a Hi-FAME (High Feedback-Assessment-Multimedia-Environment) Model in WBI (Web-based Instruction) to facilitate pre-service teacher training. Participants were 30 junior pre-service teachers. Each participant was asked to use the Hi-FAME Model to design a website for a CK (content knowledge) WBI. The Hi-FAME Model utilized the WATA system to administrate a formative assessment and to construct reflective questions regarding use of the FFS system in WBI. After two months and fourteen topics of CK the WBI was completed. Findings were: (1) Participants liked to use the WATA formative assessment. The relationship between 'Number of uses of WATA formative assessment' and 'Mid-term examination scores' was significant (Pearson=.37, $p<.05$). (2) FFS system induced more active learning than traditional teaching and enabled participants to more easily and actively generalize, analyze, and internalize the materials as well as to reflect upon their own learning. The WBI with Hi-FAME model is worth investigation by WBI designers and is a useful WBI teaching strategy for teacher education. (Author)

Reproductions supplied by EDRS are the best that can be made
from the original document.

ED 476 707

[Using Hi-FAME (High Feedback-Assessment-Multimedia-Environment) Instructional Model in WBI: A Case Study for Biology Teacher Education]

[Tzu-Hua Wang
Wei-Lung Wang
Kuo-Hua Wang
Shih-Chieh Huang]

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

☐ This document has been reproduced as received from the person or organization originating it.

☐ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

PERMISSION TO REPRODUCE AND DISSEMINATE THIS MATERIAL IN MICROFICHE, AND IN ELECTRONIC MEDIA FOR ERIC COLLECTION SUBSCRIBERS ONLY, HAS BEEN GRANTED BY

T. Wang

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

2A

SE067882

BEST COPY AVAILABLE

Using Hi-FAME (High Feedback-Assessment-Multimedia-Environment) Instructional Model in WBI: A Case Study for Biology Teacher Education

Tzu-Hua Wang*, Wei-Lung Wang , Kuo-Hua Wang**, and Shih-Chieh Huang****

*Jen-Teh Junior College of Medicine, Nursing and Management
** National Changhua University of Education, Taiwan

Abstract

The study attempted to adapt two web tools, FFS system (Frontpage Feedback System) and WATA system (Web-based Assessment and Test Analysis System), to construct a Hi-FAME (High Feedback-Assessment-Multimedia-Environment) Model in WBI (Web-based Instruction) to facilitate pre-service teacher training. Participants were 30 junior pre-service teachers. Each participant was asked to use the Hi-FAME Model to design a website for a CK (content knowledge) WBI . The Hi-FAME Model utilized the WATA system to administrate a formative assessment and to construct reflective questions regarding use of the FFS system in WBI. After two months and fourteen topics of CK the WBI was completed. Findings were: (1) Participants liked to use the WATA formative assessment. The relationship between 'Number of uses of WATA formative assessment' and 'Mid-term examination scores' was significant (pearson=.37, $p<.05$). (2) FFS system induced more active learning than traditional teaching and enabled participants to more easily and actively generalize, analyze, and internalize the materials as well as to reflect upon their own learning. The WBI with Hi-FAME model is worth investigation by WBI designers and is a useful WBI teaching strategy for teacher education.

Keywords: Hi-FAME Model, WATA(Web-based Assessment and Test Analysis System), FFS(Frontpage Feedback System), WBI(Web-Based Instruction), Teacher Education

1. Introduction

Ahern, Jamison and Olivarez (2000) point out that developing web tools for teacher education is a potentially superior approach to enhance the effectiveness of teacher training programs. The Biology teacher education program in National Changhua University of Education (NCUE), Changhua, Taiwan, includes CK (Content Knowledge), PK (Pedagogical Knowledge) and PCK (Pedagogical Content Knowledge) training programs. The CK training program is composed of over 90 Biology courses; pre-service teachers are asked to take at least 50 courses. The PK training program is a two-semester teaching practicum taken the senior year. In the PK training program pre-service teachers must undertake a year of practice teaching in a junior high school, to experience the reality of in-service teaching. During PCK training, all pre-service teachers are asked to construct an e-Learning environment. The teaching web pages cover the Biology topics the student is responsible for. Furthermore, each pre-service teacher has to perform WBI and to present his e-Learning environment to the class. This research explores the introduction of a Biology PCK training program at National Changhua University of Education.

Two web development tools, the FFS system (Frontpage Feedback System) (Wang, Wang, Kuo & Huang, 2001;Wang, Wang, Huang, 2002) and the WATA system (Web-based Assessment and Test Analysis System) (Wang, Wang, Wang & Huang, 2002;Wang, Huang, Wang & Kuo, 2002), were adapted to construct a Hi-FAME (Highly Feedback-Assessment-Multimedia-Environment) Model in WBI to facilitate the pre-service teacher training. The Hi-FAME Model requires that students continuously give feedback on specific reflective questions concerning teaching web pages and apply the WATA formative

ED467882

BEST COPY AVAILABLE

assessments to evaluate students' learning effectiveness. The FFS system integrated two effective WBI strategies: the reflective question proposed by Hsiao(1997) and the writing designs mentioned by Gordon (1996). The goal of such designs in WBI is to help learners develop reflective thinking, express their own ideas about learning content, modify old thoughts or information to form new ideas, and compare new and old concepts to promote active self-construction. Additionally, the WATA formative assessment model was used to give students opportunities to for repeated practice and active learning. In addition, it is possible to build an e-Learning environment for students to self-actualize what they want to learn and to perform self-monitoring, self-evaluating, self-modifying and purpose-setting, all of which promote learning effectiveness.

2. Method

2.1 Participants

Participants were the 30 pre-service teachers (16 males and 14 females) in the Biology Department of National Chunghua University of Education. The dormitories at school were all equipped with Internet facilities and 30 students all had their own internet-connected computers. All participants possessed a reasonable degree of computer literacy, including familiarity with common word-processing programs.

2.2 Instruments

2.2.1 FFS (Frontpage Feedback System) Sign-and-feedback Teaching Model

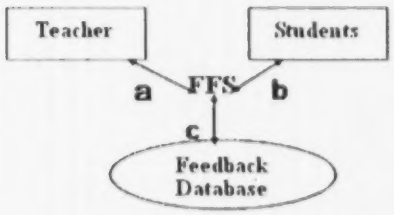

Fig. 1 System framework of FFS System

The source codes of FFS system were programmed using PHP Ver.4 running on an MySQL database server system. The system framework is shown as Fig1. The core of system frame operations was categorized as a, b and c below:

a. Teachers could utilize FFS to read, query and score student feedback on the reflective questions, which had been previously recorded in the feedback database.

b. Learners could use FFS to answer the reflective questions repeatedly. At the same time, all answers were stored in the feedback database after the learners reviewed the web pages. Learners could also query others' answers.

c. FFS consistently recorded and stored student and teacher feedback information in the feedback database for future reference by students and teachers.

2.2.2The Design of WATA System (Web-based Assessment and Test Analysis System)

The core of WATA system was programmed using PHP (Ver. 4) and Perl (Ver.5) and utilized MySQL (Ver. 3.23) to effectively handle huge item pools and large amounts of data for analysis. The WATA system utilizes a Triple-A Module (Assembling, Administrating and Appraising) and can be used to administrate summative assessment and formative assessment. The Triple-A Module is explained below:

a. Assembling: construct item pools and test papers and schedules for tests. The assembling functions in the WATA system included: 'Expert Item Pool', 'Property Serial Number', 'Constructing Test with Two-Way Chart', 'Setup and Arrangement of Multi-exam Schedule'.

b. Administrating: administrate tests to students safely and fairly.

c. Appraising: analyze the process data of tests. The appraising functions in the WATA system included: 'Item Analysis', 'Test Analysis', and 'Misconception Analysis'.

2.3 Procedures & Data Collection

The teaching curriculum used in this research was "Biology Teaching Materials and Methods," an important required course for Biology pre-service teachers. The purpose of this course was to train the Biology Pedagogical Content Knowledge (PCK) of pre-service high-school biology teachers. The course

BEST COPY AVAILABLE

was taught using web-based instruction (WBI). This WBI differed from commons WBI because the entire body of teaching web pages and WBI design were created by the pre-service teachers, and all WBI was built in accordance with the Hi-FAME Model.

At the beginning of the course, the professor divided the content of high school Biology into 30 topics, such as cell division, reproduction, ecology, and so forth. The contents were assigned to the 30 pre-service teachers; participants responsible for the each topic had to gather data and create a WBI about this topic. They then had to use the self-established WBI to give the two-week instruction, teaching in two weeks, to the other 29 pre-service teachers in turns. The 29 pre-service teachers had to enter the lecturer's WBI website in their off-hours and then study as the lecturer responsible for the topic required. In other words, the lecturer responsible for the topic acted as expert and teacher of the topic for the other teachers, who had to play the role of teachers and the others played the role of learners. After the two-week WBI, the participants responsible for the topic had to evaluate, analyze, and score the WBI learning conditions and effectiveness of other 29 pre-service teachers, or answer the online questions asked by other pre-service teachers during the weekly face-to-face class time with the professor.

As each participant designed the WBI environment for the topic at hand, they had to construct reflective questions regarding the contents of the teaching web pages, and embed them into the WBI by Hyperlink (Fig2). Additionally, participants also had to construct their own WATA item pools, at least 50 topically-related items, and then assemble and administrate WATA formative assessments in their WBI (Fig3). The other pre-service teachers had to finish the reflective questions and the WATA formative assessments as demanded by the content of web pages, internet resources, or materials for reference, in the required time. Furthermore, participants were able to answer the reflective questions and apply for the WATA formative assessments repeatedly (the WATA system randomly selects 10 items from the pre-service teacher's item pool of 50 items, and assembles a formative assessment. Testees can repeatedly apply for and answer the formative assessment in the WBI). Finally, the participant responsible had to evaluate and interact with the answerer and afterwords, he had to analyze the learning effectiveness utilizing feedback from the reflective questions and test analysis of WATA system (Fig4) during the face-to-face lecture with the professor after the two-week WBI.

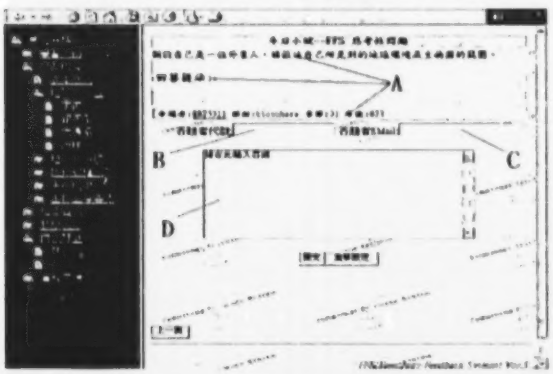

Fig2. Sample pages of answers on reflective question in the FFS. 'A' is the content, parameters and hints of the reflective question. Participants should key-in their ID in 'B', email address in 'C' and answers in 'D'.

Fig3. Sample web page showing application of the WATA formative assessment utilizing the Hi-FAME Model.

After 14 topics were finished (March and April, 2002), the WATA summative assessment was used to evaluate the learning effectiveness of those 14 topics. In addition, a questionnaire about the effects of the FFS sign-and-feedback teaching module was used to interview fifteen randomly-selected participants to collect qualitative data. The data recorded in the WATA system, including the WATA formative assessment and WATA summative assessment, was used as quantitative data for the study.

2.4 Research Questions

This study tried to answer the following questions:

BEST COPY AVAILABLE

1. What are the effects, and effectiveness, of the FFS sign-and-feedback teaching module in the Hi-FAME model used in WBI for pre-service teachers?
2. What are the effects, and effectiveness, of the WATA formative assessment module used in the Hi-FAME model in WBI for pre-service teachers?

3. Concluding Remarks

(1). The FFS sign-and-feedback teaching module in Hi-FAME Model made the participants more active in their learning styles and learning process than traditional teaching classrooms. Interviewees indicated that they could select the time and place of study, thus enabling them to learn effectively on a flexible schedule. In addition, interviewees also acquired more meaningful knowledge in terms of learning achievements, and they believed that the FFS sign-and-feedback teaching module was worth promoting.

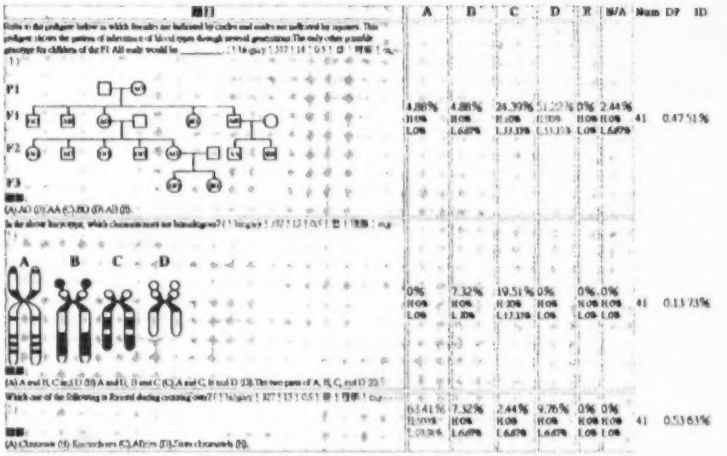

Fig4. 'A-E' are the possible decisions on each item, 'N/A' represents testees who did not answer, 'Num' is how many people answered this item, 'DP' represents 'Discriminating Power', 'ID' represents 'Item Difficulty' and 'H:' is the percentage of the testees in the upper group who selected a given answer, while 'L:' signifies testees in lower group

(2). The reflective questions that the FFS sign-and-feedback teaching module offered helped interviewees grasp key points and enhanced their confidence in their own learning.

(3). FFS sign-and-feedback teaching module in the Hi-FAME Model, similar to in-class quizzes, can replace the supervision and inquiry of the traditional classroom teaching. Additionally, the FFS sign-and-feedback teaching module has an asynchronous function for interaction, enabling learners to answer more thoughtfully than in the traditional classroom. Moreover, the Internet made learners answer questions more deeply and broadly, and stimulated students to ponder and answer.

(4). Quantitative results indicated that participants liked to make use of the WATA formative assessment to assist their own learning (the average number of log-ons per user was 86.13 and the average number of vists to each topic was 6.97 during the two-week period of instruction for each topic). In addition, the relationship between 'Number of uses of the WATA formative assessment' and 'Scores of the WATA summative assessment' was positively remarkable (Pearson=.37, $p<.05$, $n=30$), which indicates that the WATA formative assessment played an important role in the learning effectiveness of WBI.

(5). As the research revealed, Hi-FAME Model is a practical and effective strategy for teacher education on the internet, since the internet allows instructors to build e-Learning environments that reflect their own style. Pre-service teachers can act as formal teachers, extending their instruction outside the classroom in the process of building a WBI teaching environment and instructing students with WBI. In other words, the teacher's role does not stop as the bell rings. Consequently, this may be more effective than traditional teacher training programs. Additionally, if the internet instruction strategy is applied to the development of CK (content knowledge), learners will be able to choose appropriate times to learn, which can also extend the learning out of class.
Overall learning will be self-paced and self-regulated, potentially superior to traditional learning guided by teachers.

(6). In the future, e-learning systems originally designed for instructor use should be opened to pre-service teachers, practice teachers and in-service teachers. This can help them create internet

BEST COPY AVAILABLE

materials and teach students via the internet. Pre-service teachers can thus simulate the role of formal teachers, and develop their PK (pedagogical knowledge) and PCK abilities. To this end, teacher training and development tools in the OELE (Open-Ended Learning Environment) should be configured to stimulate teacher development by using targeted internet information technology

4. References

1. Ahern, Terence C., Jamison, Mark and Olivarez, Arturo (2000). *Designing the Next Generation of Tools Using an Open Systems Approach: A Usability Study*. ERIC Document: EDD444585.
2. Wang, T. H., Wang, W. L., Kuo, L. Y., Huang, S. C. (2001,10). *A Research on the Web-Based Sign-and-Feedback Teaching Module of General Biology*. The 2001 Annual Conference of the International Council for Educational Media--Conseil International des Medias Educatifs (ICEM-CIME).
3. Wang, T. H., Wang, W. L. & Huang, S. C. (2002, 7). *Utilizing FFS (Frontpage Feedback System) Sign-And-Feedback Teaching Module as Meta-cognition Strategy for Pre-service Biology Teachers Training: A Case Study of PCK Training Program*. 2002 International Conference on Chinese Language Computing (ICCLC2002). Taichung: Feng Chia University, Taiwan.
4. Wang, T. H., Wang, K. H., Wang, W. L. & Huang, S. C. (2002, 6). *Design and Evaluation of a Web-based Assessment and Test Analysis System (WATA)*. The 6th Global Chinese Conference on Computers in Education/National Education Informatization Forum(GCCCE2002). Beijing :Beijing Normal University, China.
5. Wang, T. H., Huang, S. C., Wang, W. L. & Kuo, L. Y. (2002, 6). *Development of a Web-based Assessment System-A Case Study*. The 6th Global Chinese Conference on Computers in Education/National Education Informatization Forum (GCCCE2002), Beijing :Beijing Normal University, China.
6. Hsiao, Y. (1997). *The Effects of Cognitive Styles and Learning Strategies in a Hypermedia Environment: A Review of Literature*. Retrieved April 13, 2001, from *http://www.edb.utexas.edu/mmresearch/Students97/Hsiao/*
7. Gordon, J. (1996). Tracks for learning: Meta-cognition and learning technologies. *Australian Journal of Educational Technology*, 12, 1, pp.46-55.

5. Acknowledgment

This study has been supported by National Science Council Taiwan, R.O.C., under Grant No. NSC 90-2511-S-018-015 and NSC 91-2511-S-018-024. We deeply appreciate their financial support and encouragement.

SE067882

U.S. Department of Education
Office of Educational Research and Improvement (OERI)
National Library of Education (NLE)
Educational Resources Information Center (ERIC)

REPRODUCTION RELEASE

(Specific Document)

I. DOCUMENT IDENTIFICATION:

Title: Using Hi-FAME (High Feedback - Assessment - Multimedia - Environment) Instructional Model in WBI : A Case Study for Biology Teacher Education

Author(s): Tzu-Hua Wang ; Wei-Lung Wang ; Kuo-Hua Wang ; Shih-Chieh Huang

Corporate Source: National Changhua University of Education

Publication Date: 2003.4

II. REPRODUCTION RELEASE:

In order to disseminate as widely as possible timely and significant materials of interest to the educational community, documents announced in the monthly abstract journal of the ERIC system, *Resources in Education* (RIE), are usually made available to users in microfiche, reproduced paper copy, and electronic media, and sold through the ERIC Document Reproduction Service (EDRS). Credit is given to the source of each document, and, if reproduction release is granted, one of the following notices is affixed to the document.

If permission is granted to reproduce and disseminate the identified document, please CHECK ONE of the following three options and sign at the bottom of the page.

The sample sticker shown below will be affixed to all Level 1 documents	The sample sticker shown below will be affixed to all Level 2A documents	The sample sticker shown below will be affixed to all Level 2B documents
PERMISSION TO REPRODUCE AND DISSEMINATE THIS MATERIAL HAS BEEN GRANTED BY Sample TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC) 1	PERMISSION TO REPRODUCE AND DISSEMINATE THIS MATERIAL IN MICROFICHE, AND IN ELECTRONIC MEDIA FOR ERIC COLLECTION SUBSCRIBERS ONLY, HAS BEEN GRANTED BY Sample TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC) 2A	PERMISSION TO REPRODUCE AND DISSEMINATE THIS MATERIAL IN MICROFICHE ONLY HAS BEEN GRANTED BY Sample TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC) 2B
Level 1 ☐	Level 2A ☑	Level 2B ☐
Check here for Level 1 release, permitting reproduction and dissemination in microfiche or other ERIC archival media (e.g., electronic) *and* paper copy.	Check here for Level 2A release, permitting reproduction and dissemination in microfiche and in electronic media for ERIC archival collection subscribers only	Check here for Level 2B release, permitting reproduction and dissemination in microfiche only

Documents will be processed as indicated provided reproduction quality permits.
If permission to reproduce is granted, but no box is checked, documents will be processed at Level 1.

I hereby grant to the Educational Resources Information Center (ERIC) nonexclusive permission to reproduce and disseminate this document as indicated above. Reproduction from the ERIC microfiche or electronic media by persons other than ERIC employees and its system contractors requires permission from the copyright holder. Exception is made for non-profit reproduction by libraries and other service agencies to satisfy information needs of educators in response to discrete inquiries.

Sign here, → please

Signature: Tzu-Hua Wang; Shih-Chieh Huang; Wei-Lung Wang; Kuo-Hua Wang
Printed Name/Position/Title:

Organization/Address: National Changhua University of Education
No.2 Jen-Der Rd., Changhua City, Taiwan, 500

Telephone: 886-4-7232105 ext 7988 FAX: 886-4-7211190

E-Mail Address: biogary@sciedu.ncue.edu.tw Date: 2003. 5. 7

(over)

SE067882

U.S. Department of Education
Office of Educational Research and Improvement (OERI)
National Library of Education (NLE)
Educational Resources Information Center (ERIC)

REPRODUCTION RELEASE

(Specific Document)

I. DOCUMENT IDENTIFICATION:

Title: Using Hi-FAME (High Feedback - Assessment - Multimedia - Environment) Instructional Model in WBI : A Case Study for Biology Teacher Education.	
Author(s): Tzu-Hua Wang ; Wei-Lung Wang ; Kuo-Hua Wang ; Shih-Chieh Huang	
Corporate Source: National Changhua University of Education.	Publication Date: 2003 4

II. REPRODUCTION RELEASE:

In order to disseminate as widely as possible timely and significant materials of interest to the educational community, documents announced in the monthly abstract journal of the ERIC system, *Resources in Education* (RIE), are usually made available to users in microfiche, reproduced paper copy, and electronic media, and sold through the ERIC Document Reproduction Service (EDRS). Credit is given to the source of each document, and, if reproduction release is granted, one of the following notices is affixed to the document.

If permission is granted to reproduce and disseminate the identified document, please CHECK ONE of the following three options and sign at the bottom of the page.

The sample sticker shown below will be affixed to all Level 1 documents

PERMISSION TO REPRODUCE AND DISSEMINATE THIS MATERIAL HAS BEEN GRANTED BY

Sample

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

1

Level 1

☐

Check here for Level 1 release, permitting reproduction and dissemination in microfiche or other ERIC archival media (e.g., electronic) and paper copy.

The sample sticker shown below will be affixed to all Level 2A documents

PERMISSION TO REPRODUCE AND DISSEMINATE THIS MATERIAL IN MICROFICHE, AND IN ELECTRONIC MEDIA FOR ERIC COLLECTION SUBSCRIBERS ONLY, HAS BEEN GRANTED BY

Sample

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

2A

Level 2A

☑

Check here for Level 2A release, permitting reproduction and dissemination in microfiche and in electronic media for ERIC archival collection subscribers only

The sample sticker shown below will be affixed to all Level 2B documents

PERMISSION TO REPRODUCE AND DISSEMINATE THIS MATERIAL IN MICROFICHE ONLY HAS BEEN GRANTED BY

Sample

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

2B

Level 2B

☐

Check here for Level 2B release, permitting reproduction and dissemination in microfiche only

Documents will be processed as indicated provided reproduction quality permits.
If permission to reproduce is granted, but no box is checked, documents will be processed at Level 1.

I hereby grant to the Educational Resources Information Center (ERIC) nonexclusive permission to reproduce and disseminate this document as indicated above. Reproduction from the ERIC microfiche or electronic media by persons other than ERIC employees and its system contractors requires permission from the copyright holder. Exception is made for non-profit reproduction by libraries and other service agencies to satisfy information needs of educators in response to discrete inquiries.

Sign here, → please

Signature: Tzu-Hua Wang / Wei-Lung Wang / Kuo-Hua Wang / Shih-Chieh Huang	Printed Name/Position/Title:
Organization/Address: National Changhua University of Education. 1M07 Jin-De RD, Changhua City, Taiwan, ROC	Telephone: 886 4 723 5288 ext. 5523 / FAX: 886 4 723 3795
E-Mail Address: bhuang@scitech.nchu.edu.tw	Date: 2003.5.7